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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/712,563
Filing Date: November 13, 2003
Appellant(s): BIGUS ET AL.

Roy W. Truelson
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed June 25, 2007 appealing from the Office action mailed January 24, 2007.

(1) Real Party in Interest

The real Party in interest has been identified in the Appeal Brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,278,986 Kaehler et al. 8-2001

Kaehler, Steven; "Fuzzy Logic - An Introduction";

http://www.seattlerobotics.org/encoder/mar98/fuz/; March 1998; parts 1-6.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1- 11, 13 -16, 18-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Steven D. Kaehler ("Fuzzy Logic"; Parts 1-6).

As per claims 1, 18, and 24 Kaehler anticipates an apparatus, said apparatus comprising: a controller (e.g., a proportional temperature controller, page 2) a curve matching mechanism (e.g., Part 4, pgs. 1-2 "Membership Function"; the examiner reads "Membership function as a curve matching mechanism because it defines the overlaps between inputs and outputs a response) that executes under the direction of said controller, said curve matching mechanism receiving curve data as an input (e.g., Part 3, page 1, lines 6-13; pages 3-4; figures 3-4; Part 4, or Figure 6; Input has two conditions "error" and "error-dot". Moreover, the values in the rule matrix are used as input to plot the graph of the membership function), said curve data comprising a plurality of data points representing a curve (e.g., Part 1, page 2, lines 13-16; Part 3, page 1, lines 6-13; pages 3-4; figures 3-4; Part 4, or figure 6; Error-dot is the error slope or rate of change (a curve) of the data received (plurality of points). Moreover, the values in the rule matrix (a plurality of data points) will be used to plot the graph of the

membership function.), said curve matching mechanism using Fuzzy Logic to describe said curve represented by said curve data and to thereby create curve data description information, said curve data description information (the examiner reads the output curve as "curve data description information") then being available to said controller (Part 3, page 2 or Figure 1; looking at figure 1 it shows the output being distributed to the heater and cooler then to the "controlled" environment).

As per claims 2, 19 and 25, Kaehler anticipates the apparatus of claim 1 wherein said controller is a Fuzzy Logic controller that executes on a processor (Part 1, page 2, the examiner reads that a Fuzzy logic can be built into a large computerized process control system which can be a processor').

As per claims 3, 8, 20 and 26, Kaehler anticipates the apparatus of claim 1 wherein said curve data is time series data (Fig. 2; the examiner reads the axis labeled "Time" as time series data).

As per claims 4, 9, 21 and 27 Kaehler anticipates the apparatus of claim 1 wherein said curve data is described by comparing said curve data to at least one standard curve, said at least one standard curve being a Fuzzy Set (Part 4, page 1, Define functional overlaps between inputs to determine their influence on the "fuzzy output sets". The examiner reads that the output set is a Fuzzy set.

As per claims 5, 10, 22 and 28, Kaehler anticipates the apparatus of claim 1 wherein said curve data description information is an output curve (Part 6, Figure 8; the examiner reads figure 8 as the out curve for the data).

As per claims 6, 11, 23 and 29, Kaehler anticipates the apparatus of claim 5 wherein said at least one output curve shows a degree of similarity between said curve data and said at least one standard curve (Part 4, Figure 7; the examiner reads the graph showing the degree of membership which is the similarity between inputs).

As per claim 7, Kaehler anticipates an apparatus, said apparatus comprising: a Fuzzy Controller that executes on a processor (See rejection of claim 2 as set forth above), and a curve matching mechanism that executes under the direction of said Fuzzy Controller, said curve matching mechanism receiving curve data as an input; said curve data comprising a plurality of data points representing a curve, said curve matching mechanism using Fuzzy Logic to describe said curve represented by said curve data and to thereby create curve data description information, said curve data description information then being available to said Fuzzy Controller, said Fuzzy Controller then using said curve description information to at least partially control said apparatus (See rejection of claim 1 as set forth above).

As per claim 30, Kaehler anticipates a method, said method comprising the steps of: receiving data representing an input curve as input (Part 4, Figure 6; Input has two conditions "error" and "error-dot". Error-dot represents the rate of change (a curve) of the data); determining membership of said input curve in at least one Fuzzy Set, each said Fuzzy Set expressing a property of a respective at least one curve (Part 4, pages 1 and 2; the output curve generated will express the properties of the input curve);

outputting at least one respective input curve membership value representing degree of membership of said input curve in each said Fuzzy Set (Part 4, pages 1 and 2; determining the degree of membership); and using said at least one respective input curve membership value to at least partially control an apparatus (Part 2, page 2, lines 8-25; Part 6, page 3, "Tuning and system Enhancement").

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12-17 are rejected under 35 U. S. C. 103(a) as being unpatentable over Kaehler as set forth above, in view of Kamihira (US Patent No. 6,278,986).

As per claims 12 and 17, Kaehler teaches the method of a Fuzzy Controller that executes on a processor and a curve matching mechanism that executes under the direction of said Fuzzy Controller, said curve matching mechanism receiving curve data as an input, said curve data comprising a plurality of data points representing a curve, said curve matching mechanism using Fuzzy Logic to describe said curve data and to thereby create curve data description information, said curve data description information then being available to said Fuzzy Controller, said Fuzzy Controller then using said curve description information to at least partially control said apparatus as set above in claim 7.

Kaehler does not particularly call for an engine.

Kamihira et al. discloses an automobile engine (e.g., Col. 20, Lines 31-33, Fig. 3) Kaehler and Kamihira are analogous art because they both deal with fuzzy logic on a large computerized process control system.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate the fuzzy logic on an automobile engine.

Motivation for doing so would have been to be able to analyze measurements and to make adjustments to the engine's behavior.

Therefore, it would have been obvious to combine Kamihira with Kaehler for the benefit of having a fuzzy controller and an automobile engine that uses fuzzy logic to create curve data description information to obtain the invention as specified in claim 12.

As per claim 13, Kaehler teaches this limitation as set forth above in the rejection of claim 3 and is rejected on the same basis.

As per claim 14, Kaehler teaches this limitation as set forth above in claim 4 and is rejected on the same basis.

As per claim 15, Kaehler teaches this limitation as set forth above in claim 5 and is rejected on the same basis.

As per claim 16, Kaehler teaches this limitation as set forth above in claim 6 and is rejected on the same basis.

As per claim 17, Kamihira teaches the apparatus of claim 12 in view of Kaehler as set forth above wherein said engine is contained within a vehicle (Kamihira teaches the engine being an automobile engine Col. 20, Lines 31-33, Fig. 3).

(10) Response to Argument

In reference to Applicant's arguments:

On pages 7-10, the Applicant argues that Kaehler does not disclose that fuzzy logic is used to describe a curve represented by multiple data points.

Examiner's response:

In response, the examiner disagrees. Kaehler discloses fuzzy logic used to describe a curve(s) represented by multiple data points throughout the reference (see e.g., Part 1, pg. 2; Part 4, pgs. 1-3; Part 5, pgs. 1-3; or Part 6, pgs. 1-4) the use of Fuzzy logic to control a system (Part 3, pgs. 1-3); data describing parameters of the system is obtained (see e.g., part 2, page 2, L8-34; or part 9, page 1, L6-13); and fuzzy logic operations used with this data to control the system (part 1, pages 1 and 2; or part 2, page 2, L8-25).

In re pg. 8, the Appellant argues that Kaehler's fuzzy logic is used to describe the data points, not the curve represented by the data points and that claim 1 recites "...said curve data comprising a plurality of data points representing a curve, said curve matching mechanism using fuzzy logic to describe said curve represented by said curve data...".

In response, it is important to note that there is no difference to a computer. Meaning, just because the appellant draws a box on a flow chart (see e.g., appellant's Fig. 4A) that says "curve match" does not mean a picture of a curve is drawn on a paper with a pencil and scanned into a computer. How would a computer programmer write a program that equates to the flow chart? What does the program look like at it's most basic level, for example in assembly language?

Looking at appellant's own disclosure (see paragraphs 0025 and 0026 below) it is more clear that computer programs use equations of lines, if-then statements, and/or algorithms that compare data points or values. The computer system disclosed by the appellant is not using real curves drawn on paper by humans or printers and performing image analysis to compare pictures of curves. Both the appellant and the applied art operate in the standard way of using equations, or algorithms to accept data points input from e.g., sensors and compare said data points to values associated in fuzzy membership functions and fuzzy curves.

[0025] Certain matching factors are also supplied to FCM 205. The matching factors are used to vary the degree of strictness used **by the algorithm** in determining the degree of difference between the input curves and the standard curves. Blocks 420 and 440 of Figure 4A are used to ensure that the input curve is compared to each Fuzzy Set. Since we have yet to compare the input curve to a Fuzzy Set, block 420 will test out to YES, meaning the truth value index will be set to zero (0) in block 435. Block 440 tests out to NO since the comparison has just begun.
[0026] Moving next to Figure 4B, the first input curve **value** (i.e., at location 0) is **compared** with the first curve **value** of the first standard curve [block 450]. FCM 205 then determines whether there is any difference between the two **values** [block 452]. (In the preferred embodiment, the difference is calculated by taking the absolute value of the difference between the standard curve value from the input curve value.) If not, FCM 205 sets the first value of the output curve to 1 [block 454] before incrementing the index in block 490 and returning to block 440 of Figure 4A. If there is a difference detected in block 452, FCM 205 next determines in block 460 whether the difference is within the first matching factor. In the preferred embodiment, the first matching factor used by FCM 205 is purely a consideration of amount of difference. If the difference is fairly small, as determined by the matching factor, the curves are considered to be identical at **the point** represented by the standard and **input values**. If the difference is determined to be within the first matching factor the output value is set to 1 minus the difference. If the difference is not within the first matching factor, FCM 205 considers whether the curves are fiat. If the curves are flat they are considered to match at that point. If the curves are flat, the output value is set to

the minimum of 1 minus the value of the second matching factor and 1 (i.e., Min (1 - MF_2, 1)).

Furthermore, as claim 1 states, and also by definition, a curve is a plurality of data points that describe something or amount to an equation of a line (when plotted for a human). Fuzzy logic is used to describe the curve **represented by the curve data** (the data points). If the data points represent the curve, it is to these points that fuzzy logic is applied. Moreover, when curve data (that is data that can be viewed as a curve by a human) is in input into a computer system, the computer will receive the data points and it is upon these data points that the computer will operate on since the actual "curve" may only be for human viewing. Meaning, using an equation of a line such as Y=mX+b does not generate a "curve" unless one hooks up a display to a computer and outputs the results of various values of "X". If no display is used, the computer still obtains the same results for output "Y".

Kaehler system receives fuzzy parameters of error and error-dot collected over time (see e.g., part 3, page 1, L6-13, page 3, or Figure 2). It should be noted that error-dot is a time derivative of the error parameter, which is a measure of the rate of change or slope of a value (a curve, part1, page 2, L13-18). As shown in figure 2 on page 3 of part 3, these data points will generate a curve. A membership function is applied to each input to determine their magnitude of participation (part 4, pages 1-3, or Figures 5 or 6). The input membership values are used as weighting factors to determine their influence on the fuzzy output (part 4, pages 1-3). The degree of membership is determined by projecting the selected input parameter (error or error-dot) into the membership function (a curve) (part 4, pages 2 and 3, figures 5 and 6). Therefore, if

fuzzy logic is used on each of the data points to determine the fuzzy response, a description of the "curve" that is formed by the data points is obtained.

In re pg. 8, the appellant argues the distinction may be a subtle one, but many great inventions are based on subtlety.

In response the examiner disagrees that there is any real difference in the computer method. Unless the appellant wants to argue the computer system disclosed by the appellant uses real curves drawn on paper by humans or printers and performs image analysis to compare pictures of curves (which there is no support for), the USC 102 rejection stands.

In re pg. 10, appellant argues Kaehler discloses data points and not curves.
In response, see above response to pg. 8 arguments.

In reference to Applicant's arguments:

On pages 9-10 the Applicant argues that Kaehler does not disclose how the individual data points of instantaneous time derivative of temperature vs time are obtained and that Kaehler's fuzzy logic engine does not know or care.

Examiner's answer

It is noted that the claims in the instant application do not describe how the data is obtained. The claim only recites "receiving curve data". Therefore the fuzzy system of the instant application does not "know" how the data is obtained and does not care.

However, Kaehler discloses a control system that obtains data from sensors and this data is subtracted from a command line to compute an error and then time differentiated to yield the error slope or rate of change of error (part 1, page 2, "How Does FL Work"). This is the data that is fed into the fuzzy engine of Kaehler.

In reference to Appellant's arguments:

On pages 11-12, the Applicant argues that Kaehler does not disclose determining membership of an input curve in a fuzzy set which expresses a property of a curve.

Examiner's response:

As stated above, a curve is a plurality of points that describe something. Kaehler discloses a membership function that describes the magnitude of representation of each input. The membership defines functional overlaps between the inputs and determines an output response. The degree of membership is determined by projecting the input parameters into the membership function (part 4, pages 1-3, or Figs 5 or 6). The degree of membership will describe a property of the input data (the curve).

In reference to Appellant's arguments:

On page 12, the Applicant argues that the Examiner improperly rejected the claims under 35 USC 103 because neither Kaehler nor the secondary reference alone or in combination fairly teach or suggest the key claim limitations.

Examiner response:

As set forth above, Kaehler discloses the key limitations of the claims (the curves). The Kamihira reference was used to reject other limitations not disclosed in the Kaehler reference (an engine) and motivation has been provided to make the combination of the references.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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